

## **REMARKS**

### **The Rejections Under §112 and Claim Objections**

Claim 1 has been rewritten to recite “kerosene and/or gas oil” at line 2 in order to be consistent with the terminology in the remainder of the claim. Claims 5-7, 9, 10, 13, and 15 have been rewritten to further clarify what was already believed clear, to correct typos, and to conform with more conventional US patent practice terminology without narrowing the scope of the claims except for specifying that the effluent from step (b) is partially depleted. The section 112 and claim objections are believed overcome.

### **The Rejections Under 35 U.S.C. §103**

Claims 1-3, 5-8, 10 and 15 stand rejected under 35 U.S.C. §103 as being unpatentable over WO 96/17903. Applicants respectfully traverse for the reasons given below.

WO 96/17903 discloses a hydrodesulfurization process for effecting a hydrocarbon feedstock comprising supplying the feedstock to distinct hydrotreatment zones. First and second hydrotreatment zones each contain a charge of a sulphided hydrotreatment catalyst. The first hydrotreatment zone causes hydrodesulfurization of the feedstock which includes aromatics and organic sulfurous impurities. Nowhere does the reference disclose the amount of catalyst that is used in the hydrotreatment zones, only that the catalyst may be cobalt and molybdenum or nickel and molybdenum under pressure conditions that range from 1.5 to 20 MPa and temperature conditions ranging from 220 °C to 420 °C (specification at page 21). It can be determined that the quantity of catalyst in the first hydrotreatment zone is 50% of the total catalyst quantity based on the same space velocities between hydrotreatment zones 1 and 2 being equivalent and equal to 1. As amended, claim 1 in the instant application recites that the quantity of catalyst used in the first step is about 5 to 40% by weight of the total quantity of catalyst used in the process. Conversely, the reference does not provide any disclosure or motivation to one of ordinary skill in the art to utilize a smaller amount of catalyst in the first step. In fact, it was disclosed that the higher H<sub>2</sub>S partial pressure in the first hydrotreatment zone has an inhibiting effect on the desulfurization rate (see e.g, page 2, lines 1-17). This disclosure would lead one of ordinary skill in the art to actually use a greater quantity of catalyst in the first step, not less.

It is also important to appreciate that refiners have been using hydrodesulfurization units which can reduce sulfur content, for example, from about 10,000 ppm down to about 300-500 ppm. For the purpose of removing still further sulfur down to 50 ppm; for example, it would be obvious to add another catalyst bed in series, but the added bed would be required to remove for example, only about 250-450 ppm of sulfur as compared to the 9500 ppm of sulfur removed in the first bed as compared to the main existing bed. Consequently, a chemical engineer of ordinary skill would provide a much smaller amount of catalyst in the added bed. It is thus very surprising that applicant's process flies in the face of a logical design, achieving an unexpected advantage as seen from the results obtained in the comparative example 3 versus applicant's process in examples 4 and 5.

In order to find a proper legal basis for obviousness under §103, there must be a teaching or suggestion or motivation in a prior art reference to modify the product or process to arrive at the claimed product or process, *In re Laskowski et al* (CAFC 1989) 871 F.3d 115, 10 PQ2d 1397. Conversely, the prior art would teach away from the present invention, therefore, there is a clear legal basis for withdrawal of the rejection of the claims under §103.

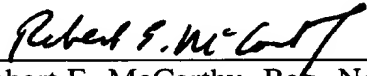
Claim 4 is rejected under §103 as being obvious over WO 96/17903 as applied to claim 1, further in view of Pruiss ('557). Applicants traverse this rejection on the basis of the arguments recited above as relates to claim 1. Pruiss does not cure the defect in the WO 96/17903 reference. Any combination of flashing as disclosed by Pruiss would clearly not lead to applicant's claimed invention. Therefore, any rejection of claim 4 which depends from claim 1 is improper and should be withdrawn.


Claims 9 and 11-14 stand rejected under §103 as being obvious over WO 96/17903 in view of Brdige. Bridge discloses hydrogenating catalysts which contain a halogen and phosphorous. This does not cure the defect in the WO reference is discussed above. Claims 9 and 11-14 depend from claim 1 and any combination of halogen and phosphorous with the process of the WO reference clearly would not lead to applicant's claimed invention. does not lead to applicant's claimed invention. Any rejection of these claims is clearly improper and should be withdrawn.

In view of the above remarks, favorable consideration is courteously requested. However, if there is any remaining issues which can be expeditiously resolved by a telephone conference, the Examiner is courteously requested to telephone the undersigned at the number indicated below.

Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached pages are captioned "Version With Markings to Show Changes Made".

Respectfully submitted,

  
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**VERSION WITH MARKINGS TO SHOW CHANGES MADE TO THE CLAIMS**

Please amend the claims as follows:

1. (Amended) A process for hydrodesulphurising a kerosene and/or a gas oil cut, comprising:

at least one first hydrodesulfurization step a) in which said ~~gas oil~~ kerosene and/or gas oil cut and hydrogen are passed over a catalyst disposed in a fixed bed comprising on a mineral support, at least one metal or compound of a metal from group VIB of the periodic table in a quantity, expressed as the weight of the metal with respect to the weight of the finished catalyst, of about 0.5% to 40%, at least one non noble metal or compound of a non noble metal from group VIII of said periodic table in a quantity, expressed as the weight of the metal with respect to the weight of the finished catalyst, of about 0.1% to 30%, and

b) at least one subsequent second step b) in which a gas fraction containing ~~at least~~ a portion of the resultant hydrogen sulphide contained in the total effluent from said first hydrodesulfurization step a) and an effluent that is partially depleted in hydrogen sulphide are recovered,

c) at least one third step c) in which at least a portion of the hydrogen sulphide-partially depleted effluent from step b) and hydrogen are passed over a catalyst disposed in a fixed bed comprising, on a mineral support, at least one metal or compound of a metal from group VIB of the periodic table in a quantity, expressed as the weight of the metal with respect to the weight of the finished catalyst, of about 0.5% to 40%, at least one non noble metal or compound of a non noble metal from group VIII of said periodic table, in a quantity, expressed as the weight of the metal with respect to the weight of the finished catalyst, of about 0.1% to 30%, wherein the quantity of catalyst used in the first step is about 5% to about ~~50%~~ 40% by weight of the total quantity of catalyst used in said process.

2. (Amended) ~~A~~ The process according to claim 1, ~~in which~~ wherein the quantity of catalyst used in the first step is about 10% to about 40% of the total quantity of catalyst used in said process.

3. (Amended) ~~A~~ The process according to claim 1, ~~in which~~ wherein step b) for recovering a gas fraction at least a portion of the hydrogen sulphide contained in the total effluent from step a) is carried out by stripping using at least one hydrogen-containing gas at a pressure substantially identical to that prevailing in the first step and at a temperature of about

100°C to about 450°C under conditions such that a gaseous stripping effluent containing hydrogen and hydrogen sulphide is formed along with a liquid feed that is depleted in hydrogen sulphide.

4. (Amended) ~~☆~~ The process according to claim 1, ~~in which~~ wherein step b) for recovering a gas fraction containing ~~at least~~ a portion of the hydrogen sulphide contained in the total fraction contained in the total effluent from step a) is carried out by flashing the total effluent from step a).

5. (Amended) ~~☆~~ The process according to claim 1, ~~in which~~ wherein the operating conditions for step a) comprise a temperature of about 240 °C to about 420 °C, a total pressure of ~~about~~ about 2 MPa to about 20 MPa and an hourly space velocity of liquid feed of about 0.1 to about 5 and that of step c) comprises a temperature of about 240 °C to about 420 °C, a total pressure of about 2MPa to about 20 MPa and an hourly space velocity of liquid feed of at most equal to approximately the hourly space velocity of liquid feed in step a).

6. (Amended) ~~☆~~ The process according to claim 1, ~~in which~~ wherein the catalyst used in step a) and that used in step c) each comprise at least one metal or compound of a metal from group VIB selected from the group ~~formed by~~ consisting of molybdenum and tungsten and at least one metal or a compound of a metal from group VIII selected from the group ~~formed by~~ consisting of nickel, cobalt and iron.

7. (Amended) ~~☆~~ The process according to claim 1, ~~in which~~ wherein the catalyst used in step a) and that used in step c) each comprise molybdenum or a compound of molybdenum in a quantity, expressed as the weight of metal with respect to the weight of finished catalyst, of about 2% to 30%, and at least one of a metal or at least one of a compound of a metal from the group ~~formed by~~ consisting of nickel and cobalt in a quantity, expressed as the weight of metal with respect to the weight of the finished catalyst, of about 0.5% to 15%.

8. (Amended) ~~☆~~ The process according to claim 1, ~~in which~~ wherein the catalyst used in step a) and that used in step c) each comprise nickel as the group VIII metal, and molybdenum as the group VIB metal.

9. (Amended) ~~A~~ The process according to claim 1, ~~in which~~ wherein the catalyst used in step a) and that used in step c) each further comprise at least one element selected from the group ~~formed by~~ consisting of silicon, phosphorous and boron or one or more compounds of ~~those said~~ elements.

10. (Amended) ~~A~~ The process according to claim 1, ~~in which~~ wherein the support for the catalysts used in step a) and in step c) are selected independently from the group ~~formed by~~ consisting of alumina, silica, silica-aluminas, zeolites, magnesia, titanium oxide  $\text{TiO}_2$  and mixtures ~~of at least two of these mineral compounds~~ thereof.

11. (Amended) ~~A~~ The process according to claim 1, ~~in which~~ wherein the catalysts used in step a) and in step c) each comprise at least one halogen.

12. (Amended) ~~A~~ The process according to claim 1, ~~in which~~ wherein the catalysts used in step a) and in step c) each comprise a quantity of halogen of about 0.1% to about 15% by weight with respect to the weight of the finished catalyst.

13. (Amended) ~~A~~ The process according to claim 1, ~~in which~~ wherein the catalysts used in step a) and in step c) each comprise at least one halogen selected from the group ~~formed by~~ consisting of chlorine and fluorine.

14. (Amended) ~~A~~ The process according to claim 1, ~~in which~~ wherein the catalysts used in step a) and in step c) each comprise chlorine and fluorine.

15. (Amended) ~~A~~ The process according to claim 1, ~~in which~~ further comprising passing the gas fraction recovered in step b) containing hydrogen sulphide ~~is sent to a zone for eliminating~~ wherein at least a portion of the hydrogen sulphide it ~~contains~~ is eliminated and, from which a zone purified hydrogen is recovered ~~that~~ and is recycled to the ~~inlet to~~ intense first hydrodesulphurization step a).